

TECHNICAL OUTPUT

The Navy continues to be a pioneer in initiating new developments and a leader in applying these advancements to military requirements. The primary method of informing the scientific and engineering community of the advances made at NRL is through the Laboratory's technical output—reports, articles in scientific journals, contributions to books, papers presented to scientific societies and topical conferences, patents, and inventions.

The figures for calendar year 2000 presented below represent the output of NRL facilities in Washington, D.C.; Bay St. Louis, Mississippi; and Monterey, California.

In addition to the output listed, NRL scientists made more than 1257 oral presentations during 2000.

Type of Contribution	Unclassified	Classified	Total
Articles in periodicals, chapters in books, and papers in published proceedings	1014	9	1023
NRL Formal Reports	20	10	30
NRL Memorandum Reports	94	7	101
Books	0	0	0
Patents granted			80
Statutory Invention Registrations (SIRs)			3

*This is a provisional total based on information available to the Ruth H. Hooker Research Library and Technical Information Center on January 25, 2001. Additional publications carrying a 2000 publication date are anticipated.

TECHNOLOGY TRANSFER AT NRL

NRL is committed to transitioning the technologies it develops into products or services for military or civilian use. Many of NRL's technologies have commercial applications in addition to the defense-oriented objectives for which they were originally developed. NRL developments in areas such as radar, radio, satellite navigation, fiber optics, chemical and biological sensors, and a wide variety of materials and coatings have made significant contributions to the safety and welfare of the military and civilian communities.

An example of an important NRL technology transfer to the operational Navy is the nonskid coating formulations developed by Dr. Robert Brady and Mr. Larry Kraft of NRL's Chemistry Division. The patent covering these formulations was awarded the 1999 Vice Admiral Harold G. Bowen Award. This award is given annually to a patented invention that has been of the greatest benefit to the Navy. The NRL nonskid coatings have improved safety for the sailors aboard Navy ships and have reduced maintenance costs.

The transitioning of NRL's dual-use technologies to the private sector is facilitated by NRL's Technology Transfer Office. This office implements the Technology Transfer Act by which Congress authorized Federal Laboratories such as NRL to participate in Cooperative Research and Development Agreements (CRADAs) and patent licensing agreements. NRL has entered into more than 250 CRADAs with industry, universities, nonprofit organizations, and other government organizations. In addition, NRL has executed more than 40 licenses to its inventions.

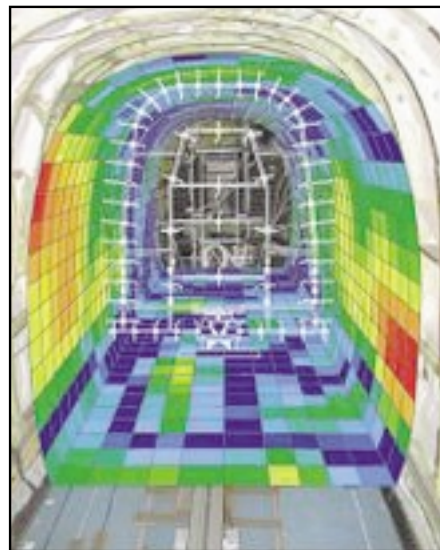
Entering into a CRADA is an excellent way for U.S. companies to gain access to commercially important NRL research and development capabilities. As the Navy's corporate laboratory, NRL draws on the powerful resources of an interdisciplinary combination of scientific expertise and modern facilities. NRL's technical staff is recruited from all disciplines of engineering and the physical sciences and is available to work with private companies to solve technical problems in any area of research that is consistent with NRL's mission.

During FY 00, NRL signed CRADAs with small and large companies as well as with universities. In some cases, NRL is working under a CRADA to tran-

sition technology that has been licensed to the CRADA partner or is under negotiation for license. In other cases, NRL is contributing expertise in the development of new technology for commercial use or to benefit the civilian community.

For example, the Materials Science and Technology Division is collaborating under a CRADA with Nanosphere, Inc., to adapt NRL's surface acoustic wave sensors for application in monitoring patients for compliance with prescription drug dosage instructions. These sensors, incorporated into a breath analysis device, use chemoselective polymers to detect specific pharmaceuticals or odorant taggants.

Under the scope of another CRADA, Cessna Aircraft Company is working with NRL on a project directed at the design of quieter aircraft interiors. NRL is using its near acoustic holography method to develop a structural acoustic model of a Cessna aircraft interior. The design guidance enabled with this NRL tool is aimed at a next generation of quieter business jets.

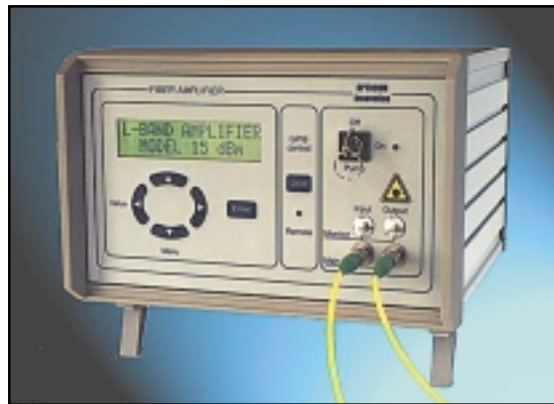


Under a CRADA with Cessna Aircraft Company, nearfield acoustical holography has been combined with boundary element methods to model airplane fuselage vibration. In this reconstruction, highest vibration levels are observed on the wall in front of the propellers and on the floor in front of the wing support.

NRL supports an active licensing program and has more than 500 patents available for licensing in fields as diverse as advanced materials, chemistry, biotechnology, optics, ocean and atmospheric sciences, electronics, radar, and satellite technology. A license to a Navy invention authorizes the licensee to manufacture and sell a product based on NRL's technology in exchange for royalty payments that are shared by the Laboratory and the inventors. In FY 00 NRL licensed phthalonitrile resin compositions for use in composite structures in the aerospace,

marine, and transportation industries; an optical fiber amplifier for optical communications, test, and measurement instrumentation and lasers; and routing software for use in wireless communication networks.

For additional information, contact NRL's Technology Transfer Office, Code 1004, 4555 Overlook Avenue, S.W., Washington, D.C. 20375-5320, or call (202)767-7230; e-mail: techtransfer@nrl.navy.mil; URL: <http://labwide14/techtransfer>.



The high-power erbium-doped fiber amplifier shown here is manufactured and sold worldwide by OptoCom Innovation under license from NRL.

KEY PERSONNEL

Area Code (202) unless otherwise listed
Personnel Locator - 767-3200
DSN-297 or 754

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6300	Superintendent, Materials Science & Technology Division	Dr. D.U. Gubser	767-2926
6400	Director, Lab. for Computational Physics and Fluid Dynamics	Dr. J.P. Boris	767-3055
6700	Superintendent, Plasma Physics Division	Dr. S. Ossakow	767-2723
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7400	Superintendent, Marine Geosciences Division	Dr. H.C. Eppert, Jr.	228-688-4650
7500	Superintendent, Marine Meteorology Division	Dr. P.E. Merilees	831-656-4721
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8100	Superintendent, Space Systems Development Department	Mr. R.E. Eisenhauer	767-0410
8200	Superintendent, Spacecraft Engineering Department	Mr. H.E. Senasack, Jr.	767-6411

EMPLOYMENT OPPORTUNITIES FOR ENTRY-LEVEL AND EXPERIENCED PERSONNEL

The *NRL Review* illustrates some of the exciting science and engineering carried out at the Naval Research Laboratory, as well as the potential for new personnel. In this regard, NRL offers a wide variety of challenging positions that involve the full range of work, from basic and applied research to equipment development. The nature of the research and development conducted at NRL requires professionals with experience. Typically there is a continuing need for electronics, mechanical, aerospace, ceramic and materials engineers, metallurgists, computer scientists, and oceanographers with bachelor's and/or advanced degrees and physical and computer scientists with Ph.D. degrees. Opportunities exist in the areas described below:

Ceramic Engineers and Materials Scientists/Engineers. These employees are recruited to work on materials, microstructure characterization, electronic ceramics, solid-state physics, fiber optics, electro-optics, microelectronics, fracture mechanics, vacuum science, laser physics technology, and radio frequency/microwave/millimeter wave/infrared technology.

Electronics Engineers and Computer Scientists. These employees may work in the areas of communications systems, electromagnetic scattering, electronics instrumentation, electronic warfare systems, radio frequency/microwave/millimeter wave/infrared technology, radar systems, laser physics technology, radio-wave propagation, electron device technology, spacecraft design, artificial intelligence, information processing, signal processing, plasma physics, vacuum science, microelectronics, electro-optics, fiber optics, solid state, software engineering, computer design/architecture, ocean acoustics, stress analysis, and expert systems.

Mechanical Engineers. These employees may be assigned to spacecraft design, remote sensing, pro-

pulsion, experimental fluid mechanics, experimental structural mechanics, solid mechanics, elastic/plastic fracture mechanics, materials, finite-element methods, nondestructive evaluation, characterization of fracture resistance of structural alloys, combustion, and CAD/CAM.

Chemists. Chemists are recruited to work in the areas of combustion, polymer science, bioengineering and molecular engineering, surface science, materials, fiber optics, electro-optics, microelectronics, electron-device technology, and laser physics.

Physicists. Physics graduates may concentrate on such fields as materials, solid-state physics, fiber optics, electro-optics, microelectronics, vacuum science, plasma physics, fluid mechanics, signal processing, ocean acoustics, information processing, artificial intelligence, electron-device technology, radio-wave propagation, laser physics, ultraviolet/X-ray/gamma-ray technology, electronic warfare, electromagnetic interaction, communications systems, radio frequency/microwave/millimeter wave/infrared technology, and computational physics.

Oceanographers, Meteorologists, and Marine Geophysicists. These employees work in the areas of ocean dynamics, air-sea interaction, upper-ocean dynamics, oceanographic bio-optical modeling, oceanic and atmospheric numerical modeling and prediction, artificial intelligence applications for satellite analyses, benthic processes, aerogeophysics, marine sedimentary processes, and advanced mapping techniques. Oceanographers and marine geophysicists are located in Washington, D.C., and the Stennis Space Center, Bay St. Louis, Mississippi. Meteorologists are located in Washington, D.C., and Monterey, California.

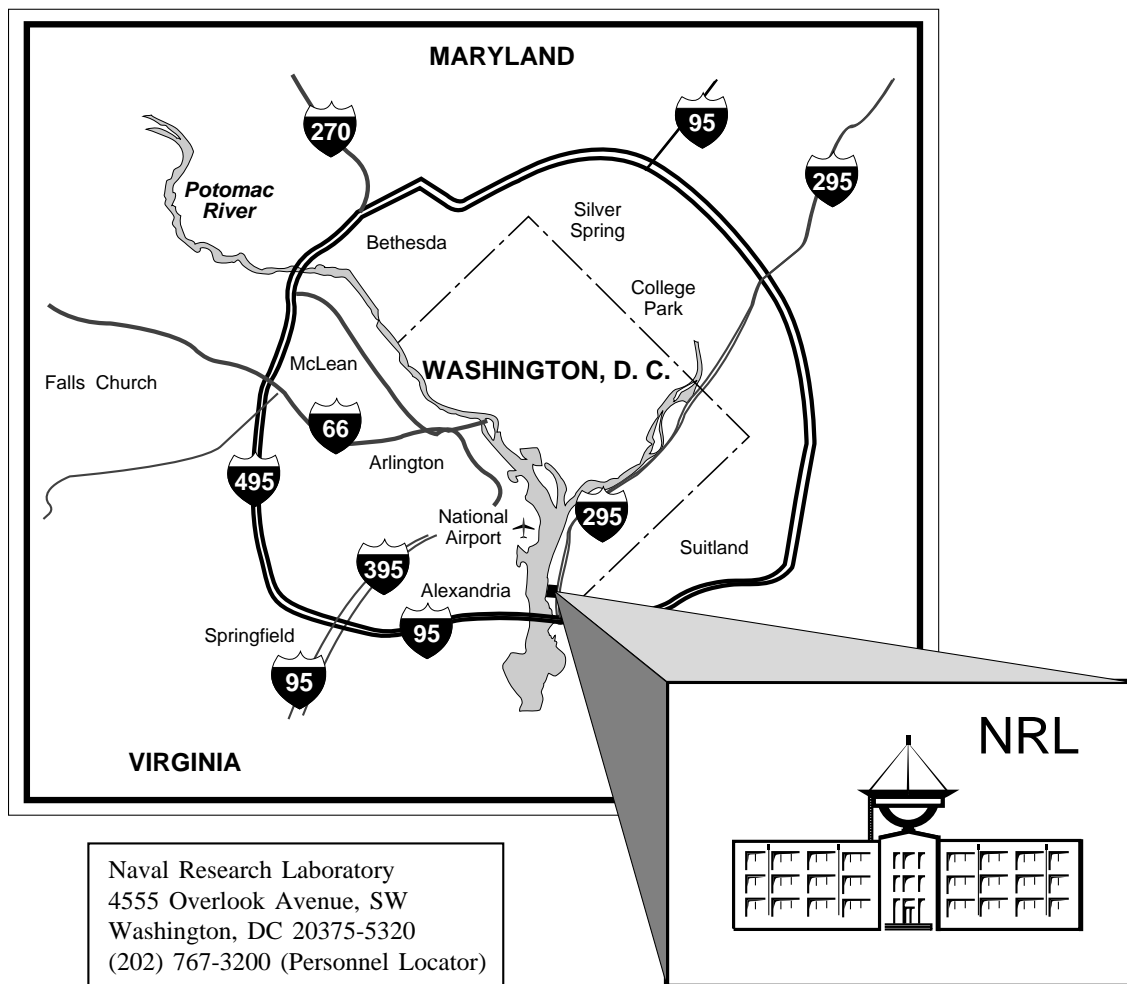
APPLICATION AND INFORMATION

Interested applicants should submit an Application for Federal Employment (SF-171), an Optional Application for Federal Employment (OF-612), or a resume. The OF-612 and SF-171 can be obtained from local Office of Personnel Management and Human Resource Offices of federal agencies.

Direct inquiries to:

Naval Research Laboratory
Human Resources Office, Code 1810 RV
Washington, DC 20375-5324
(202) 767-3030

LOCATION OF NRL IN THE CAPITAL AREA



CONTRIBUTIONS BY DIVISIONS, LABORATORIES, AND DEPARTMENTS

Radar Division

- 107 WARLOC: A New 94 GHz High-Power Coherent Radar
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- 109 Directly Measuring Forward Scatter with an Ultra Wideband Radar
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- 111 A Wideband Beamformer Using True Time Delay and FPGAs
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- 97 Low-Cost, High-Sensitivity Atmospheric Ozone Detector
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- 102 Better Use of Water for Fire Suppression
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*B.R. Ringeisen, D.B. Chrisey,
B. Spargo, and A. Piqué*

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*B.T. Jonker, Y.D. Park, B.R. Bennett,
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- 107 WARLOC: A New 94 GHz High-Power
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and R. Myers*
- 113 High-Power 94 GHz Gyroklystron
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- 115 Coherent Operations on the Spin of the
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Space Systems Development Department

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